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EXAMINER	
THOMPSON, JAMES A	

ART UNIT	PAPER NUMBER
2624	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/737,512	ESCHBACH, REINER	
	Examiner	Art Unit	
	James A Thompson	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-15* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-15* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *15 December 2000* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The disclosure is objected to because of the following informalities: On page 3, line 3, the phrase "would **h** would dampen the effect" should be modified to "would dampen the effect" since this is clearly meant.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1 and 7 are rejected under 35 U.S.C. 102(b) as being anticipated by Lieberman (US Patent 5,185,671).

Claim 7 embodies all the limitations of claim 1. Claims 1 and 7 are therefore discussed together. The limitations of claim 7 that are not in claim 1 are further discussed separately.

Regarding claims 1 and 7: Lieberman discloses a method comprising receiving input data that define an input image (column 3, lines 20-25 of Lieberman); deriving from said input data (i(x',y')) lightsource data (E(x',y')) that represent an image of a lightsource in said input image (column 3, lines 37-43 of Lieberman); deriving enhanced

data that represent an enhanced image (column 5, lines 7-12 of Lieberman), said enhanced data obtained by removing the effect of said lightsource data from the input data (column 4, lines 62-65 of Lieberman).

Further regarding claim 7, said input image exhibits uneven exposure (column 5, lines 1-4 of Lieberman).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 2-6 and 8-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lieberman (US Patent 5,185,671) in view of Aach (US Patent 5,708,693).

Claims 2-6 and claims 8-12 disclose the same limitations, respectively. Claims 2-6 and claims 8-12 are therefore respectively discussed together.

Regarding claims 2 and 8: Lieberman discloses that said lightsource data is in the low spatial frequency region (column 4, lines 65-67 of Lieberman).

Lieberman does not disclose expressly that said step of deriving lightsource data comprises subsampling said input data to obtain subsampled data defining a subsampled image; low-pass filtering said subsampled data; and upsampling said low-pass filtered data to derive said lightsource data that define a full-scale image of said lightsource.

Aach discloses subsampling input data to obtain subsampled data defining a subsampled image (column 7, lines 54-56 of Aach); low-pass filtering said subsampled data (column 7, lines 51-55 of Aach). Aach discloses low-pass down-sampling filters (figure 2(101,102) of Aach) which perform both the low-pass filtering and down-sampling operations (column 7, lines 51-55 of Aach) to provide a low-pass down-sampled signal (column 7, lines 55-56 of Aach). Aach does not explicitly state which operation occurs first, but states that both occur (column 7, lines 51-55 of Aach). In fact, performing either low-pass filtering and then down-sampling or down-sampling and then low-pass filtering will achieve the same result since down-sampling will not affect the low-frequency nature of the illumination. Hence, low-pass filtering and down-sampling are independent of each other and can be performed in either order.

Aach further discloses upsampling said low-pass filtered data (column 7, lines 56-60 of Aach).

Lieberman and Aach are combinable because they are from the same field of endeavor, namely image data processing. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to use the method of Aach, namely down-sampling, low-pass filtering, and then up-sampling with an interpolator, on said lightsource data taught by Lieberman. This will result in the derivation of said lightsource data that define a full-scale image of said lightsource. The motivation for doing so would have been to reduce the level of noise in the overall image while preserving small details of said image (column 1, lines 65-67 of Aach). Therefore, it

would have been obvious to combine Aach with Lieberman to obtain the invention as specified in claims 2 and 8.

Regarding claims 3 and 9: Lieberman discloses performing a Fourier transform operation on said image data to define said image data in a frequency domain (figure 3(52) and column 4, lines 6-9 of Lieberman); applying a homomorphic filter to said image data (figure 3(54) and column 4, lines 9-14 of Lieberman); and performing an inverse of said Fourier transform operation on said homomorphically-filtered image data to define said homomorphically-filtered image data in a spatial domain (figure 3(56) and column 4, lines 17-19 of Lieberman).

Lieberman does not disclose expressly that said step of low-pass filtering comprises performing a Fourier transform operation on said subsampled data to define said subsampled data in a frequency domain; low-pass filtering said subsampled data in the frequency domain; and performing an inverse of said Fourier transform operation on said low-pass filtered subsampled data to define said low-pass subsampled data in a spatial domain.

Aach discloses sub-sampling the image data (column 7, lines 54-56 of Aach) and then low-pass filtering the sub-sampled image data (column 7, lines 51-54 of Aach), as further discussed in the arguments regarding claims 2 and 8 above.

Lieberman and Aach are combinable because they are from the same field of endeavor, namely image data processing. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to sub-sample the image data before low-pass filtering, as taught by Aach, which would result in the use of a low-pass filter

instead of the specific homomorphic filter taught by Lieberman. Since sub-sampling the image data occurs before the low-pass filtering, the Fourier transform taught by Lieberman would be performed on sub-sampled image data and the inverse Fourier transform would be performed on low-pas filtered sub-sampled data. The motivation for doing so would have been to reduce the level of noise in the overall image while preserving small details of said image (column 1, lines 65-67 of Aach). Therefore, it would have been obvious to combine Aach with Lieberman to obtain the invention as specified in claims 3 and 9.

Regarding claims 4 and 10: Lieberman discloses that said step of deriving enhanced data comprises subtracting said lightsource data from said input data (column 4, lines 28-34 and lines 60-63 of Lieberman). A linear filter is used to remove the illumination components (column 4, lines 60-63 of Lieberman) which are expressed in a linear form after logarithmic conversion to the density domain (column 4, lines 28-34 of Lieberman). In order to filter the illumination component (ln[E(x',y')]) in the logarithmic form (column 4, equation 4 of Lieberman), said illumination component would have to be subtracted from said input data (ln[i(x',y')]).

Regarding claims 5 and 11: The arguments regarding claims 4 and 10 are incorporated herein. Subtracting said lightsource data from said input data in the density domain, said density domain relation expressed in equation 4 in column 4 of Lieberman, is the same as dividing said input data by said lightsource data in the reflectance domain, said reflectance domain relation expressed in equation 2 in column 3 of Lieberman.

Regarding claims 6 and 12: Lieberman does not disclose expressly that said step of upsampling said low-pass filtered data to derive said lightsource data that define a full-scale image of said lightsource comprises interpolating said low-pass filtered data using a linear interpolating method.

Aach discloses interpolating said low-pass filtered data using a linear interpolating method (column 7, lines 56-63 of Aach).

Lieberman and Aach are combinable because they are from the same field of endeavor, namely image data processing. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to interpolate low-pass filtered data as part of the step of upsampling. The motivation for doing so would have been to smooth the up-sampled data (column 7, lines 62-63 of Aach) instead of simply using 2x2 blocks of the same pixel values. Therefore, it would have been obvious to combine Aach with Lieberman to obtain the invention as specified in claims 6 and 12.

Regarding claim 13: Lieberman discloses receiving an input image (column 3, lines 20-25 of Lieberman) having an illumination component (E(x',y')) and an object component (r(x',y')) (column 3, lines 37-43 of Lieberman); and using a full-scale image of said lightsource (E(x',y')) to reduce an effect of said illumination component in said input image (column 4, lines 62-65 and column 5, lines 7-10 of Lieberman). Lieberman further discloses that said lightsource data is in the low spatial frequency region (column 4, lines 65-67 of Lieberman).

Lieberman does not disclose expressly subsampling said input image to obtain a subsampled image; processing said subsampled image to obtain a reduced-size image

of a lightsource component of said subsampled image; deriving a full-scale image of said lightsource component of said subsampled image.

Aach discloses subsampling an input image to obtain a subsampled image (column 7, lines 54-56 of Aach). Since subsampling simply omits every second pixel value (column 7, lines 55-56 of Aach), said subsampled image is therefore processed to obtain a reduced-size image of all components of said subsampled image, including said lightsource component. Displaying each pixel of the subsampled image would naturally result in an image that is half the size in both dimensions.

Aach further discloses low-pass filtering the sub-scaled (down-scaled) image data (column 7, lines 51-55 of Aach) and then upscaling said subsampled low-pass filtered image (column 7, lines 56-60 of Aach).

Lieberman and Aach are combinable because they are from the same field of endeavor, namely image data processing. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to apply the sub-scaling, low-pass filtering, and up-scaling taught by Aach to the image processing method of Lieberman. This would result in deriving a full-scale image of said lightsource component of said subsampled image since said lightsource component is in the low spatial frequency region. The motivation for doing so would have been to reduce the level of noise in the overall image while preserving small details of said image (column 1, lines 65-67 of Aach). Therefore, it would have been obvious to combine Aach with Lieberman to obtain the invention as specified in claim 13.

Regarding claim 14: Lieberman discloses that said step of using said full-scale image of said lightsource to reduce an effect of said illumination component in said input image comprises subtracting said full-scale image of said lightsource from said input image (column 4, lines 28-34 and lines 60-63 of Lieberman). A linear filter is used to remove the illumination components (column 4, lines 60-63 of Lieberman) which are expressed in a linear form after logarithmic conversion to the density domain (column 4, lines 28-34 of Lieberman). In order to filter the illumination component (ln[E(x',y')]) in the logarithmic form (column 4, equation 4 of Lieberman), said illumination component would have to be subtracted from said input data (ln[i(x',y')]).

Regarding claim 15: The arguments regarding claim 14 are incorporated herein. Subtracting said full-scale image of said lightsource from said input data in the density domain, said density domain relation expressed in equation 4 in column 4 of Lieberman, is the same as dividing said input image by said full-scale image of said lightsource in the reflectance domain, said reflectance domain relation expressed in equation 2 in column 3 of Lieberman.

Conclusion

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Niczyporuk et al., US Patent 6,304,684 B1, 16 October 2001.

Aach et al., US Patent 6,173,084 B1, 9 January 2001.

Trew et al., US Patent 5,561,718, 1 October 1996.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to James A Thompson whose telephone number is 703-305-6329. The examiner can normally be reached on 8:30AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David K Moore can be reached on 703-308-7452. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

James A. Thompson
Examiner
Art Unit 2624

JAT
July 19, 2004

THOMAS D LEE
PRIMARY EXAMINER